CLAIMS

1. A method for fine frequency-offset error determination in a radio receiver, comprising the steps of:

sampling an OFDM radio transmission;

assuming a coarse frequency offset after compensation by a previous circuit that will not exceed approximately ±10 kHz; and

using a cost function to determine a fine-frequency offset of said OFDM radio transmission for use in a subsequent circuit providing for frequency compensation of any fine-frequency offset.

2. The method of Claim 1, further comprising the step of:

determining a coarse frequency offset of said OFDM radio transmission.

3. The method of Claim 1, further comprising the step of:

compensating any coarse frequency offset determined in a previous step to at worst approximately ±10 kHz.

4. The method of Claim 1, further comprising the step of:

finding a timing reference boundary between a short preamble and said long preamble in said OFDM radio transmission.

5. The method of Claim 1, wherein the step of using a cost function generally conforms to $C(\hat{v}) = |V_0 X_{\hat{v}}|^2 = \left|\sum_{n=0}^{63} x(n) e^{-j2\pi \frac{\hat{v}}{F_s} n}\right|^2$.

6. The method of Claim 1, wherein the step of sampling is such that said signal subspace is spanned by a set of 52 row vectors derived from a 64×64 square matrix associated with a 64-element discrete Fourier transform wherein said non-signal subspace is spanned by a set of 12 row vectors also derived from the 64×64 square matrix associated with the 64-

element discrete Fourier transform and wherein two of these vectors are real,

7. The method of Claim 1, wherein the step of sampling is such said OFDM radio transmission is typically measured in 16-bit I/Q samples every 0.05 μS, and overall can be mathematically modeled as,

$$x(n) = A(n)e^{j\Phi(n)+j2\pi\frac{\nu}{F_s}n+j\varphi} + \eta(n)$$

where,

$\Phi(n)$: long preamble phase
ν: residual frequency offset
φ: phase offset
η(n): additive white Gaussian noise (AWGN)

8. A method for fine frequency-offset error determination in a radio receiver, comprising the steps of:

sampling an OFDM radio transmission, wherein fifty-two non-zero equal magnitude subcarrier measurements are obtained that collectively represent a reference signal comprising a signal subspace and a non-signal subspace, and is such said OFDM radio transmission is typically measured in 16-bit I/Q samples every 0.05 μS, and overall can be mathematically modeled as,

$$x(n) = A(n)e^{j\Phi(n)+j2\pi\frac{\nu}{F_s}n+j\varphi} + \eta(n)$$

where,
$\Phi(n)$: long preamble phase
ν: residual frequency offset
φ: phase offset
η(n): additive white Gaussian noise (AWGN)
;

determining a coarse frequency offset of said OFDM radio transmission;

compensating any coarse frequency offset determined in a previous step to at worst approximately ±10 kHz;

finding a timing reference boundary between a short preamble and said long preamble in said OFDM radio transmission;

assuming a coarse frequency offset after compensation by a previous circuit will not exceed approximately ±10 kHz; and

using a cost function to determine a fine-frequency offset of said OFDM radio transmission for use in a subsequent circuit providing for frequency compensation of any fine-frequency offset, wherein said cost function generally conforms to $C(\hat{v})=\left|V_0 X_{\hat{v}}\right|^2=\left|\sum_{n=0}^{63} x(n)e^{-j2\pi\frac{\hat{v}}{F_s}n}\right|^2$.

9. The method of Claim 1, wherein the step of sampling is such that said signal subspace is spanned by a set of 52 row vectors derived from the 64×64 square matrix associated with the 64-element discrete Fourier transform wherein said non-signal subspace is spanned by a set of 12 row vectors also derived from the 64×64 square matrix associated with the 64-element discrete Fourier transform and wherein two of these vectors are real,